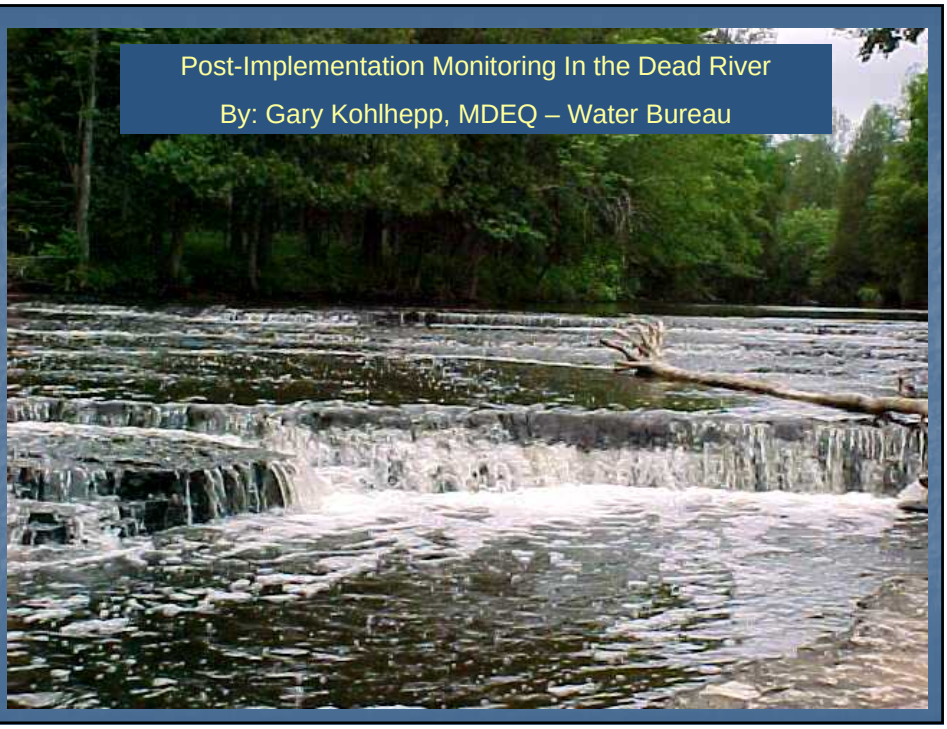
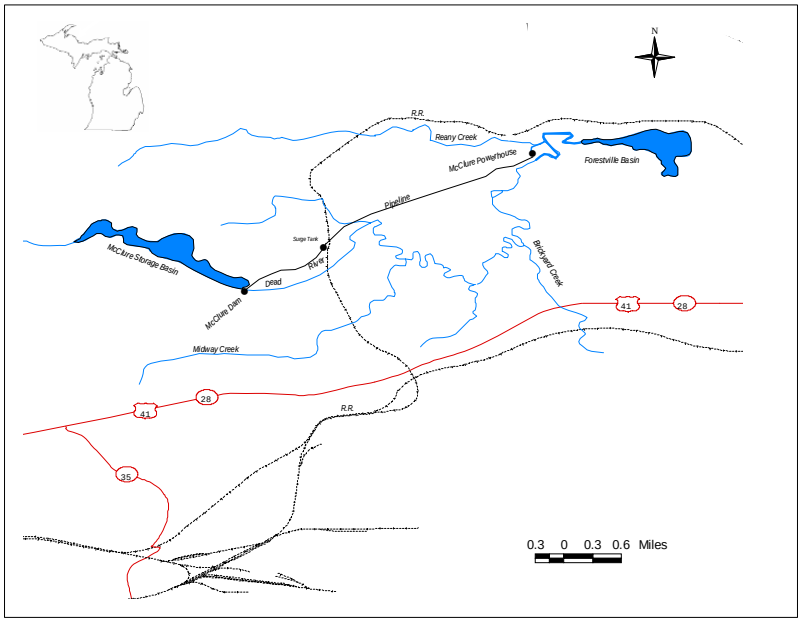


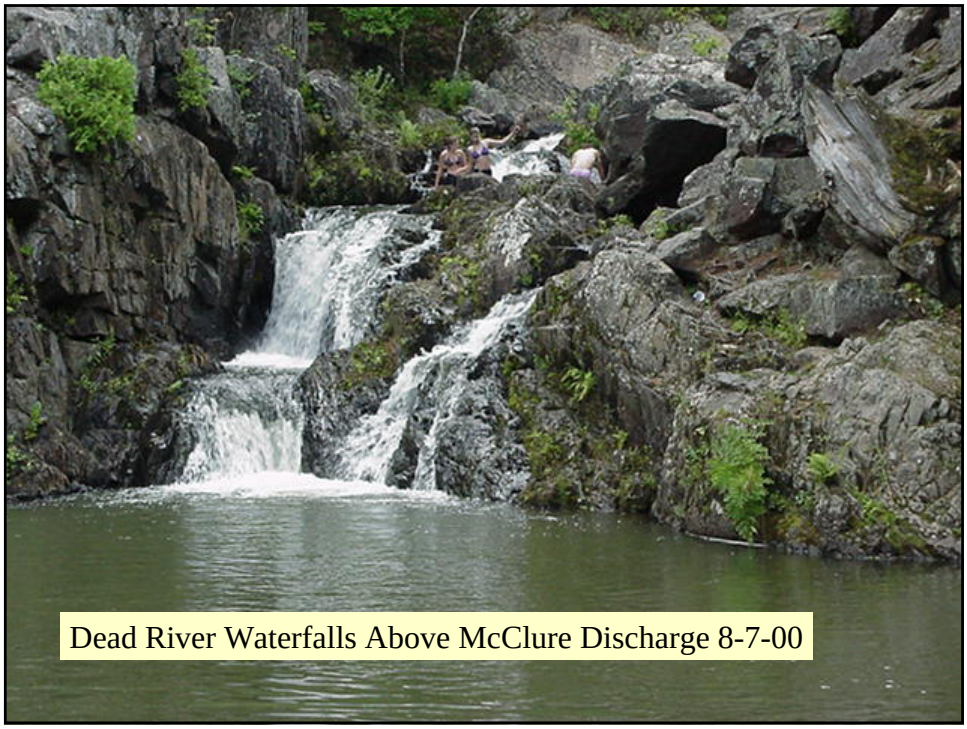
Post-Implementation Projects

- Dead River
- Kennecott Mine
- Stamp Sand Remediation
- BMP Projects (road crossings, bank stabilization, cattle exclusion, sedimentation)

Project Background

- Located in Marquette County, MI
- Water pumped from Upper Peninsula Power Company (UPPCO) dam six miles downstream
- Received minimal dam leakage and tributary flow
- In 1999, S. 401 certification required 20 cfs minimum flow release





Dead River Waterfalls Above McClure Discharge 8-7-00

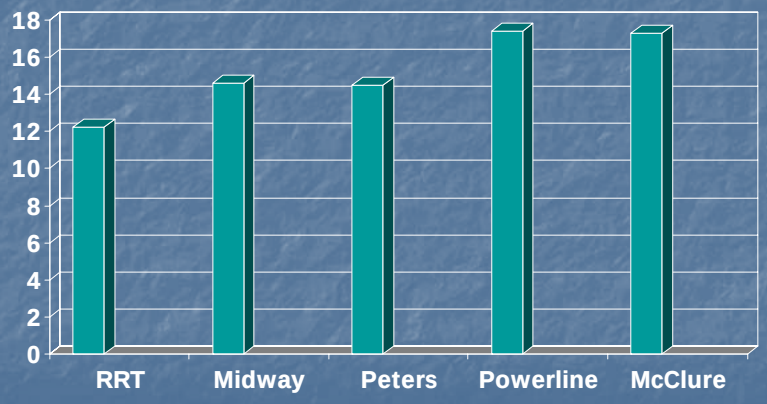
Baseline Study

- Conducted in August 2000 by MDEQ, MDNR, UPPCO
- Fish and channel morphology – quantitative, 3 reaches in 6 mile channel
- Temperature – 6 stations (5 in Dead River)

Results

- Fish:
  - Brook trout most abundant
  - 3% > 7 inches; 63% YOY
- Habitat:
  - 1.5 to 5 cfs
  - mean width < 5 feet
- Temperature:
  - 5 degree C (12.2 – 17.4) increase along channel
  - met coldwater standard

Mean August 2000 Temps (Degrees C)



Dead River Flood

- Silver Lake dam failure in May 2003 resulted in a major flood
- Complete temperature and channel morphology reassessment in 2004 (by UPPCO)
- Fish not reassessed

Dead River Flood

Tourist Park Damage

Dead River Flood

Post-Flood Results

- Water temps unchanged, except when water released over the dam (4 degree C increase)
- Channel generally wider and deeper after the 2003 flood

Morphology – 2000 vs. 2004

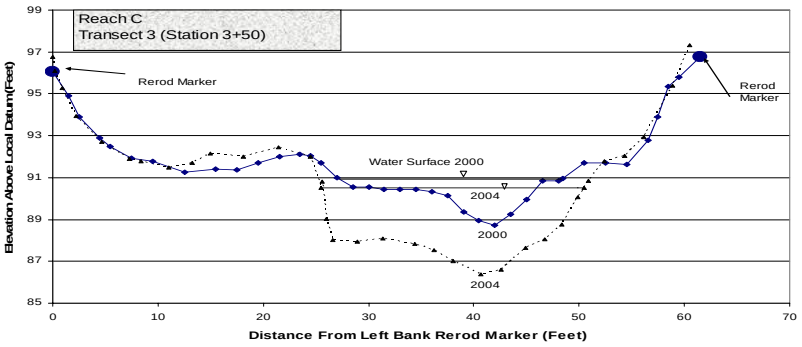
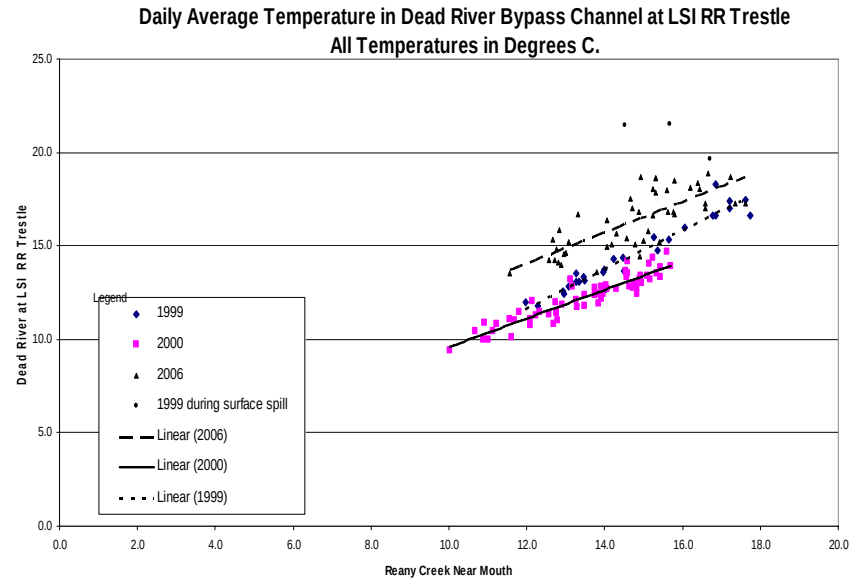
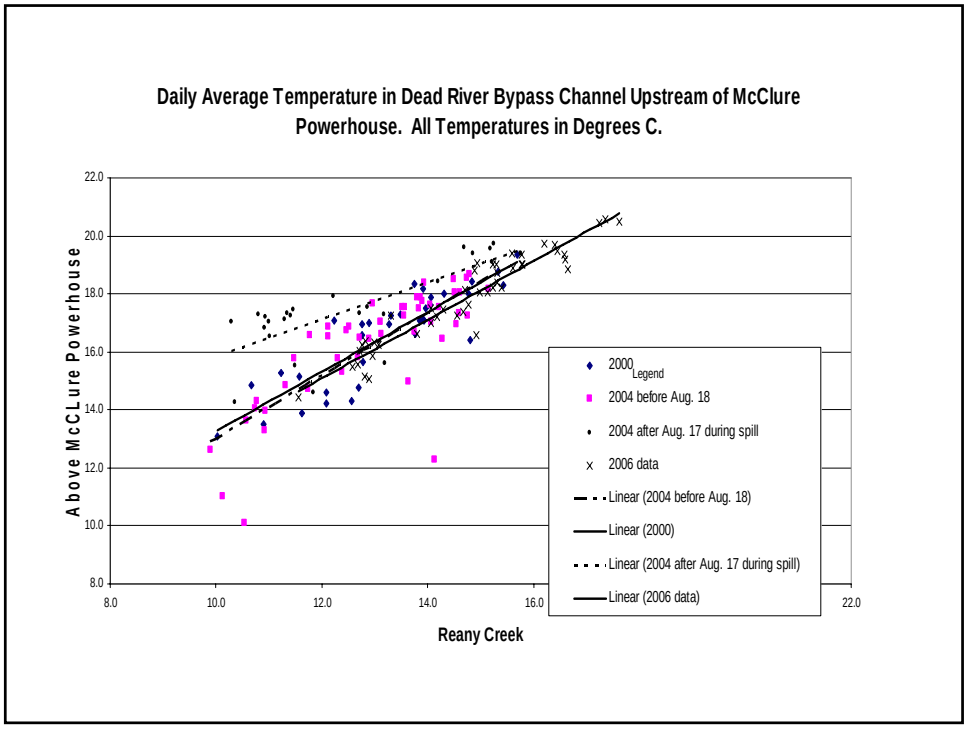


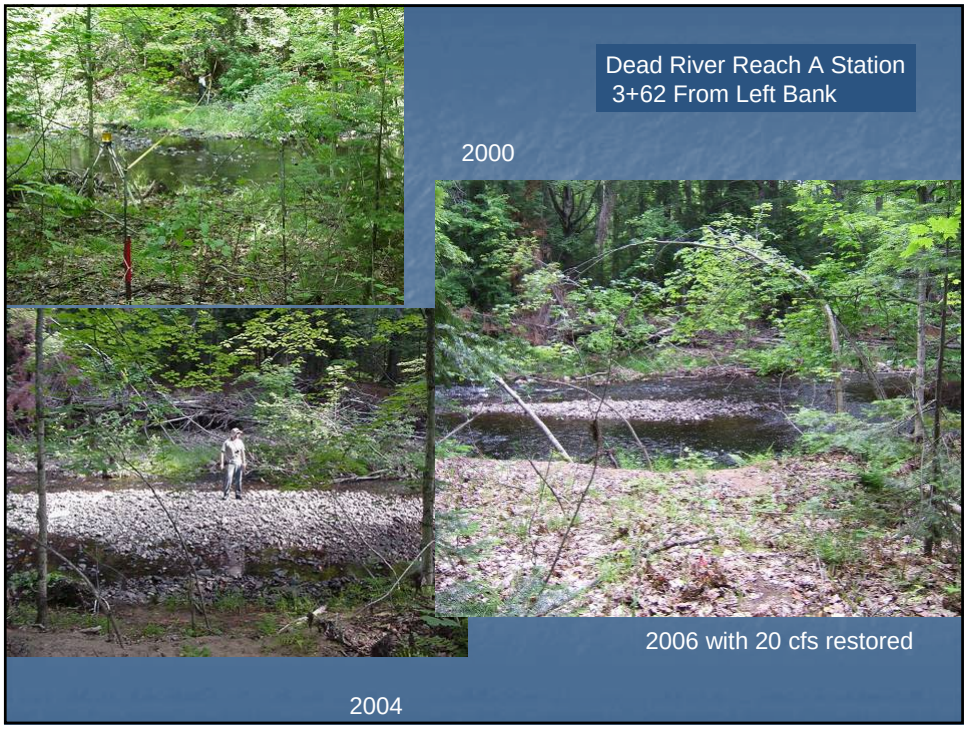
Figure 16. Cross Section Profile of Transect 3 (Station 3+50) Reach C Pre and Post Flood

Post-Implementation Results

- 20 cfs discharge began in April 2005
- In 2006, water temps were higher below the dam but similar by the end of the reach
- Water temps met cold water MWQS (20 degree C)
- Fish and channel morphology not yet reassessed, to allow for post-flood stabilization




Daily Average Temperature in Dead River Bypass Channel Upstream of McClure Powerhouse. All Temperatures in Degrees C.
Above McClure Powerhouse
Reany Creek
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
8.0
10.0
12.0
14.0
16.0
22.0
2000 Legend
2004 before Aug. 18
2004 after Aug. 17 during spill
2006 data
Linear (2004 before Aug. 18)
Linear (2000)
Linear (2004 after Aug. 17 during spill)
Linear (2006 data)


Dead River Reach A Station 3+62 From Left Bank
2000
2006 with 20 cfs restored
2004

2000

2004

"Landmark Log" in Reach C Where Temp. Probe was Moved to in 2000

2006 with 20 cfs restored

Summary and Lessons Learned

- Cooperative effort with DNR and UPPCO
- BACI Model used
- Multiple data types (temp, morphology, biology)
- Long-term commitment
- Account for confounding variables (flood)

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